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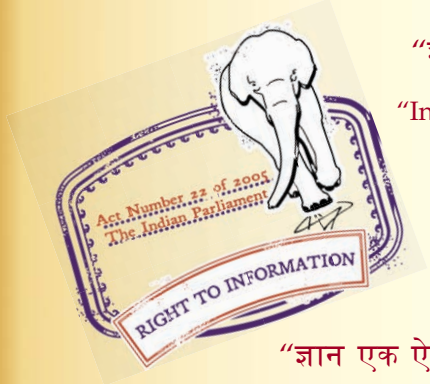

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Indian Standard

GUIDELINES FOR NAILING OF LARGE FRAMED WOODEN CONTAINERS

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GUIDELINES FOR NAILING OF LARGE FRAMED WOODEN CONTAINERS

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Indian Standard

GUIDELINES FOR NAILING OF LARGE FRAMED WOODEN CONTAINERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 September 1983, after the draft finalized by the Wood and Wood Products Containers Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 Nailing is one of the most important feature of construction of a good and sound wooden container. It is not only the strength but also the safety in handling and economics in the utilisation of material which have to be taken into account for a properly constructed container. Whereas the sizes of the nails for particular types of containers have been covered in the relevant standards, this standard gives guidelines for the nailing pattern and calculations of the size and number of nails required for different type of containers.

0.3 In the preparation of this standard guidance has been taken from BS 1133 : Section 8 : 1981 'Packaging code : Wooden containers', issued by the British Standards Institution.

0.3.1 Due consideration has been given to the rules laid down in the Indian Railways Conference Association Goods Tariff, No. 32 Part I-1965.

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1. SCOPE

1.1 This standard lays down the guidelines for the calculation of the size and number of the nails alongwith the nailing patterns of large framed wooden containers for carrying loads from 1 500-5 000 kg.

2. TERMINOLOGY

2.1 For the purpose of this standard, terms covered in IS : 6703-1972* in addition to the following shall apply.

2.1.1 *Edge Members* — Those parts of the framework forming the edges of the crate.

*Glossary of wooden packaging terms.

2.1.2 *Sills* — Internally placed longitudinal timber beams. The alternative to skids where, for example, a machine's mounting points are not its lowest part, that is, it has projections below its base (*see* Fig. 1).

2.1.3 *Skids* — External longitudinal timber beams that, together with cross boarding support the load and form the base of a case. They may be vertically laminated if length or cross section demand (*see* Fig. 2).

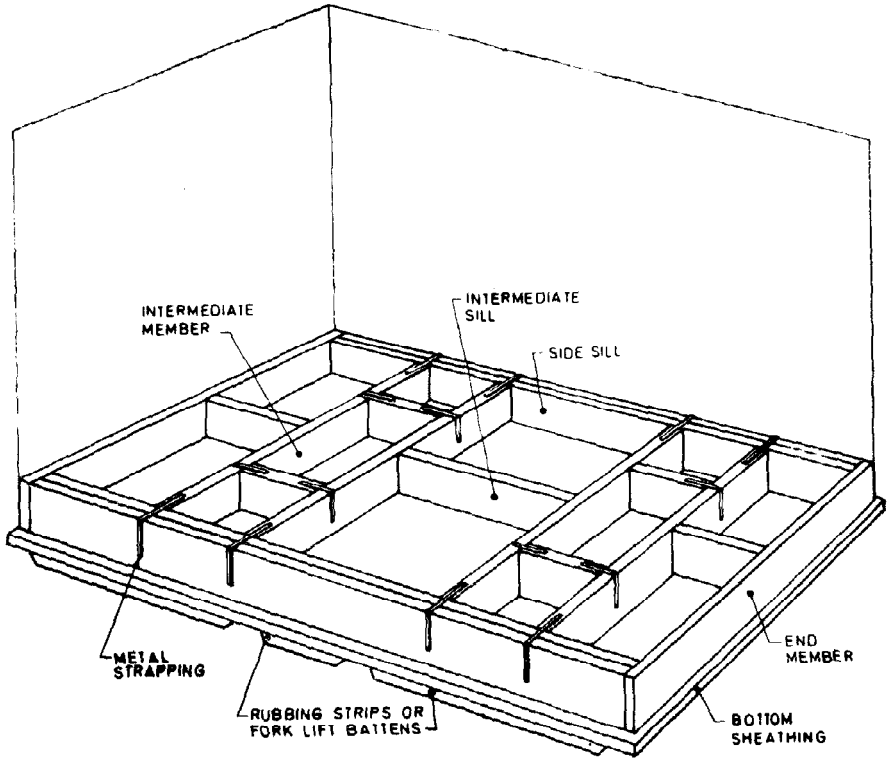


FIG. 1 SILL-BASED CASE

3. NAILS

3.1 Details of nails used in case manufacture are given in IS : 723-1972*. Cement coated (resin treated) or bright, plane, round wire nails, are recommended for case manufacture and closure. There are other types, for example, barbed, oval and grooved nails, each having advantages in

*Specification for steel countersunk head wirenails (*second revision*).

their own sphere of use, but contain disadvantages in cases and crates. Cement coated and chemically treated nails have greater retaining than bright nails and may be used in lesser thicknesses.

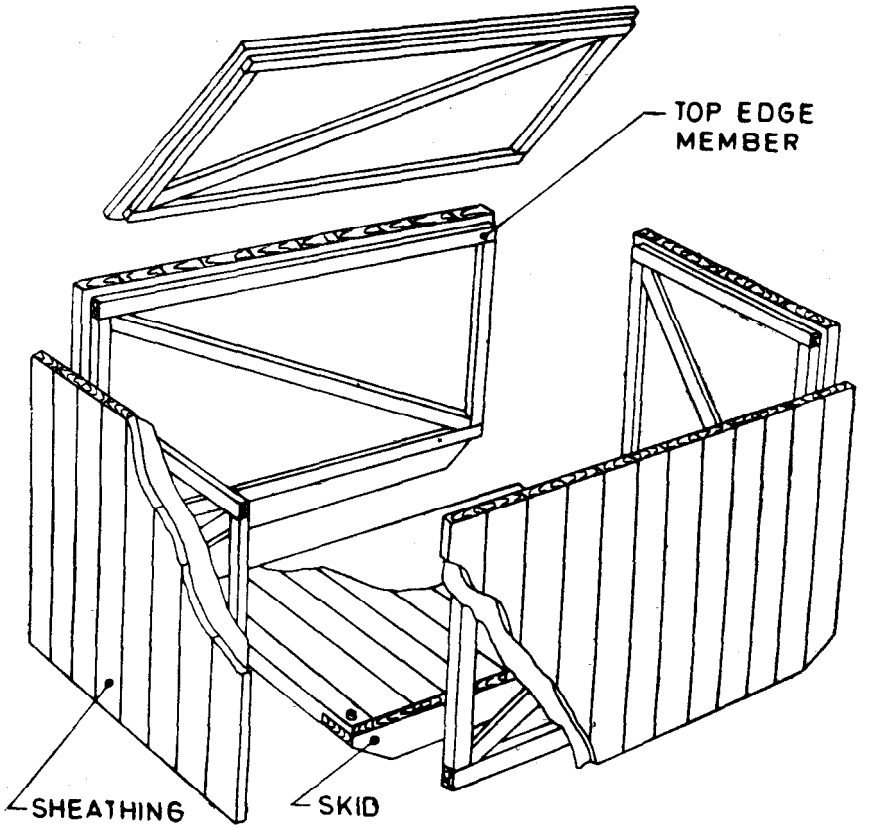


FIG. 2 SKID-BASED CASE SHOWING RAILS, SHEATHING AND SKIDS

4. NAILING OF LARGE FRAMED WOODEN CONTAINERS

4.1 Wooden Sheathed Cases

4.1.1 *General*

4.1.1.1 Nails shall be driven so that neither the head nor the point projects above the surface of the wood. Occasional overdriving of nails may be permitted, but no nail should be overdriven more than one-eighth of the thickness of the piece or 3 mm whichever is less.

4.1.1.2 In nailing together parts of different thicknesses, the nails, in general, shall be driven through the thinner into the thicker part. All nails shall preferably be driven from the outside and clinched inside.

4.1.1.3 If nails are driven into the edges of a member, minimum two-thirds of the length of the nail shall extend into the member.

4.1.1.4 When the wide faces of two or more members are nailed together the nail shall be longer by at least two times its diameter and shall be clinched. The nails shall be uniformly staggered over the area of the narrow piece.

4.1.2 *Nailing of Side and End Sheathing* — Side and end sheathing shall be attached to frame members, corner posts and struts and diagonals with nails driven through the sheathing into the members. When sections are fabricated prior to assembly, nails driven into the flat face of a member shall not exceed 50 mm. If the nails are driven into the edge of a member, two-thirds of the length of the nails shall extend into the member.

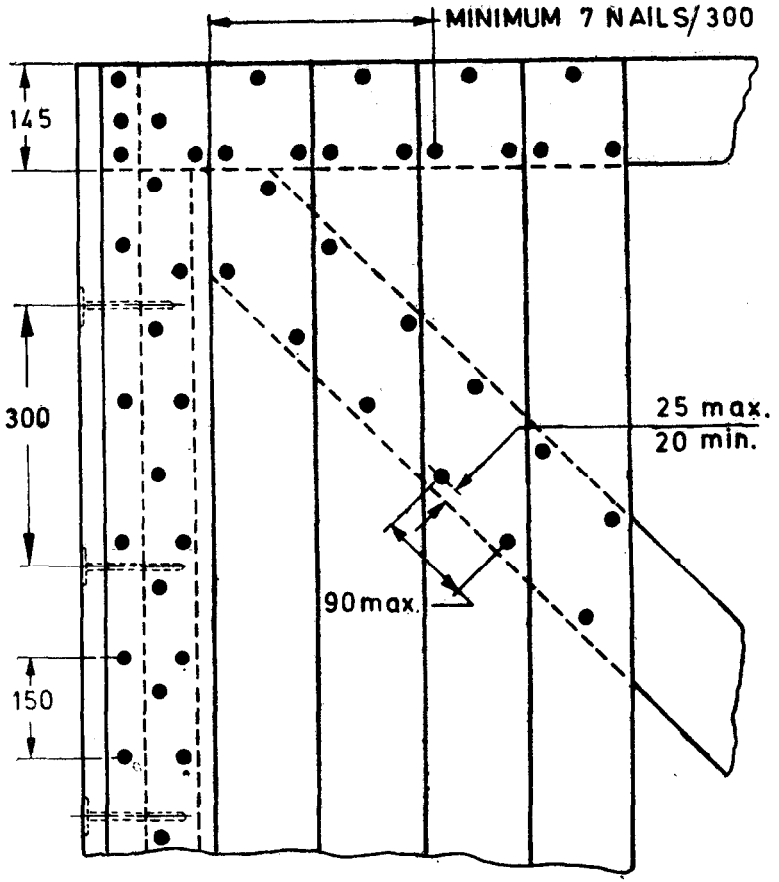
4.1.3 *Spacing of Nails for Sheathinig*

4.1.3.1 When sheathing is applied on the top and bottom edge members, the number of nails used to attach the sheathing to edge member shall not be less than 23 nails per linear metre when the edge members are less than 100 to 150 mm wide (*see* Fig. 3). When edge members are 200 mm wide the number of nails used to attach sheathing to the edge members (sills included) shall be not less than 30 nails per linear metre. There shall be a minimum of two nails in each sheathing board 60 mm to 75 mm wide and a minimum of three nails in wider boards.

4.1.3.2 When sheathing is applied to corner posts and struts, nails shall not be spaced more than 75 mm apart.

4.1.3.3 It is recommended that a jig shall be used to indicate the position of nails, or two lines properly spaced shall be drawn on the face of the panels to indicate nail spacing whenever the sections of the case are fabricated by hand.

4.1.4 *Diagonals* — Diagonals shall be secured to sheathing with nails of sufficient length to be driven through both members and clinched. Nails shall not be spaced more than 90 mm apart in each board, the outside nails being not more than 25 mm from each edge. All nails shall be staggered so that any two adjacent nails are not driven in line with the grain of either member (*see* Fig. 3).



All dimensions in millimetres.

FIG. 3 NAILING PATTERN FOR SHEATHING AND SECTION

4.1.5 *Prefabricated Top* — When crosswise sheathing is used, the top section is prefabricated by securing the top battens to the top sheathing with nails driven through the members and clinched. Nails shall not be spaced more than 75 mm apart in approximately two parallel rows from the edges of the top batten.

4.1.6 *Sills* — Nails used to fasten sill members, lengthwise frame members, and cross frame members of the base together shall be treated.

4.1.7 *Frame Members* — There shall be 2 nails at each joint at the edges of the frame members when frame members are 90 mm, 3 nails at each joint when frame members are 140 mm wide and 4 nails at each joint when frame members are 200 mm wide. The ends of the bottom sheathing boards, shall be secured to the frame members with 80 mm nails spaced on approximately 50 mm centres and staggered where possible. When nailing along the edge with the grain of the wood, nails shall be spaced approximately 150 mm apart.

4.2 Plywood Sheathed Cases

4.2.1 When the size of the case does not permit the use of a single sheet of plywood, the sheets shall be joined over a frame member of supported internally along the length.

4.2.1.1 Nails for fixing plywood to battens shall be made from steel wire not less than 2·00 mm diameter. The heads of the nails shall not be less than 6 mm diameter. The length of the nails shall not be less than the sum of the thicknesses of the plywood and the frame members plus 3 mm.

4.2.1.2 On all frame members the nails shall be staggered and clinched in two parallel rows spaced not less than 50 mm between rows. The distance between nails in any row shall not exceed 100 mm.

4.3 Selection of Sizes of Nails

4.3.1 When nails pass through the sheathing, frame members, top bracing, struts and sills of the section being attached, treated 90 mm or 100 mm, 4·50 mm diameter fully countersunk round wire nails shall be used. The diameter of the hole shall be 1 mm less than the diameter of the nail.

4.3.2 There shall be 2 nails used at each joint when driving into 45 × 100 mm members; 3 nails when driving into 45 × 150 mm members; and 4 nails when driving into 45 mm × 200 mm members.

4.3.3 Nails secring additional reinforcement members should be driven through the two members and clinched. Nails shall be spaced not further than 150 mm apart and shall be driven in two parallel lines and staggered.

4.4 Calculation of Numbers and Sizes of Nails for Skid Type Cases

4.4.1 The nails required to fix the side and end section to the skid type base shall not be spaced more than 75 mm or less than 37 mm apart. The side and number required shall be determined from Fig. 4.

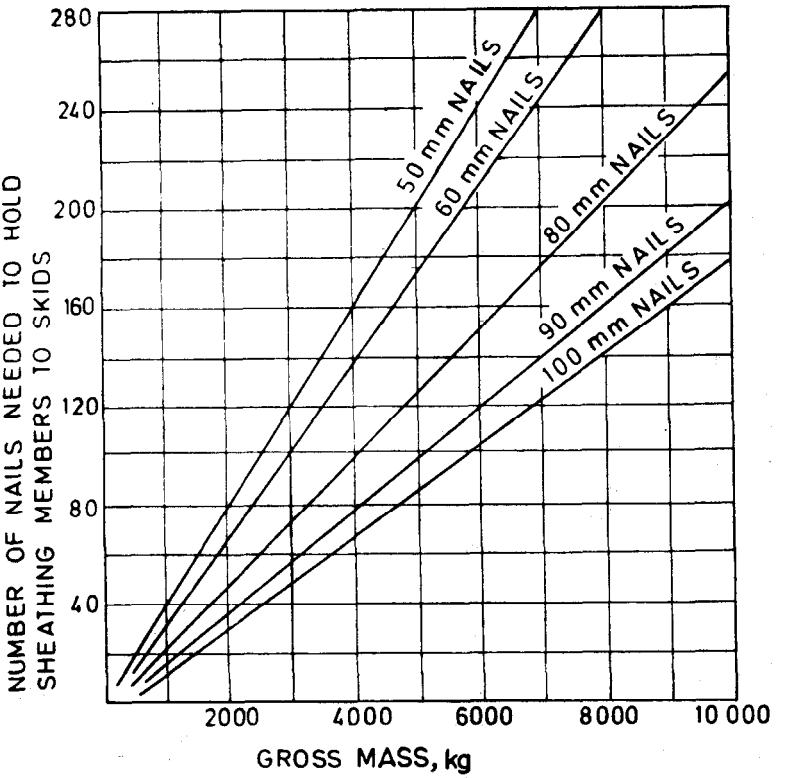


FIG. 4 CHART FOR DETERMINING NUMBER OF NAILS FOR FIXING SHEATHING TO SKIDS.

4.4.2 *How to Use the Nail Chart* (*Fig. 4*) — Follow the vertical line indicating the load to the line marked with the number of nails to be used. The point of intersection indicates the size of nails which shall be used. If the point of intersection falls between two lines of nail sizes, then the larger nail should be used. Nails should be evenly spaced around the perimeter of the case.

Example : Assume that the case is 3 000 mm long and 1 500 mm wide and has a gross mass of 4 000 kg. The case has a perimeter of 9 000 mm. Since the spacing cannot be greater than 75 mm, there can be no less than 120 nails used (9 000 ÷ 75). Referring to the chart, 120, 80 mm nails shall be used to fix ends and sides to skid type bases.

Nails larger than 100 mm shall not be used for fixing ends and side sections to the skid type base.

NOTE — When containers are transported by rail, the size of nails used shall not be less than 64 mm.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 $kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2